Manitoba

Health Health Advisory Network

308 Somerset Place
294 Portage Avenue
Winnipeg, Manitoba, CANADA
R3C 0B9

(204) 945-8599
FAX: (204) 945-1020

92-05391/

January 8, 1991

Dear Colleague:

The Health Information Systems Task Force has completed an Interim Report. This Interim Report was formally received by the Health Advisory Network Steering Committee on December 19, 1990.

Consistent with the Minister of Health's desire to ensure adequate consultation, the Steering Committee invites input from those affected by the recommendations of the Task Force before it formalizes its own recommendations. A copy of the Interim Report of the Task Force is enclosed for your review and response. Copies have been distributed to the public for comment. If you know of anyone who would be interested in receiving a copy please have them contact this office.

The sequence of the consultation process is outlined below:

1) The Interim Report of the Task Force was received by the Steering Committee.

2) The Steering Committee distributes the Interim Report to interested parties in the community for comment.

3) The community responses are to be forwarded to the Task Force for review in March, 1991.

4) The Task Force will submit its final Report to the Steering Committee, taking into account the reactions to the Interim Report.

5) The Steering Committee will review the final Report of the Task Force to formulate options and recommendations for consideration by the Minister of Health.

Your written response to the Interim Report of the Task Force should be received on or before March 8, 1991.

Please send twenty copies of your comments to:

Health Advisory Network
308 - 294 Portage Avenue
Winnipeg, Manitoba
R3C 0B9

Yours truly,

Brian Postmundson for

Arnold Naimark, M.D.
Chair
Health Advisory Network Steering
Committee

Enc.

HAN.INFO-REP

Health Information Systems

Task Force

Table of Contents

Executive Summary	1-4
Strategic Planning Issues	
Recommendations 1 to 8	5-19
Technology Issues	
Recommendations 9 to 11	20-28
Funding Policies	
Recommendations 12 to 17	29-40
Appendices:	
A. Council on Health Care Informatics	41-42
B. Attributes of a Health Care Information System	43-51
C. Attributes of a Health Care Information System Strategic Plan	52-54
D. Task Force Meetings and Guests	55-58
E. Task Force Presentations and Responses	59-60
F. Task Force Members	61-62
G. Task Force Terms of Reference	63-65

Health Information Systems

Task Force

Executive Summary

The Health Information Systems Task Force held its first meeting on February 20, 1990, and has met a total of twenty-one times concluding on December 13, 1990.

The Task Force observed that the health care sector is extremely information-intensive, and that the volumes of health records for Manitobans are critical assets in the delivery of high quality, affordable health care. Information systems can be an effective facilitator ensuring that timely, accurate information is available to health care professionals, allowing them to dedicate their time and skill to the health and well-being of Manitobans.

Presentations were encouraged from all the major Manitoba health care providers, administrative bodies, suppliers to the health care industry, and various associations and interested parties. Many groups have attempted innovative and creative initiatives in health care computing at the local level, with the aim of improving the quality of patient care. Numerous examples abound, including the Tri-Hospitals study, the work done at St. Boniface and Misericordia hospitals with Unisys equipment, the work done on departmental systems at Brandon General Hospital, and the development of a health care informatics system at Health Sciences Centre. Overall, the Task Force was very impressed with the highly commited and talented individuals in the health care field in all roles. But while we found numerous examples of innovation, tenacity and dedication to improving health care by using computer systems, we also found evidence of excessive bureaucracy.

Time and again, our Task Force was presented with evidence that supported the need for a published Provincial Health Care Strategic Plan for Information Systems. Individual health care institutions have collectively spent many millions of dollars on information systems which, for the most part, cannot be shared, cannot exchange information with each other, and are evolving in independent directions.

In the absence of such a Plan, it is probable that through the Unisys Agreement, the Department of Industry, Trade and Tourism has had a

greater influence on the strategic direction of health care information systems than the Department of Health. Through this agreement, computer technology has apparently been treated as a homogeneous commodity like gasoline or gravel, by imposing a procurement agreement which dictated technology choices. This decision made in 1986 set health care information systems for some institutions on a course that will be dependent upon Unisys technology through the end of this century.

Manitoba Health Services Commission and the Department of Health need to provide a framework within which operational units such as the hospitals and agencies can develop an integrated health care computing environment in the province.

In the absence of a Strategic Plan, we noted that numerous agencies, departments, external consultants and individuals have obtained advisory responsibilities and thereby influenced health care information systems procurement, approval, and policy, apparently through some claim to competence which has passed the scrutiny of those who are less conversant with computer systems. In general, the Task Force believes that the senior information systems staff of the larger health care institutions are more competent, experienced and knowledgeable than these individuals who have had the job of reviewing them. The current state of health care information systems is not the result of the failure to have review offices pass judgement on their merits, or to have consultants provide independent reports. It is more likely that it is *because* of reliance on such advice, which diverts attention from the fact that there is no Strategic Plan.

The current policies for approving information systems initiatives suffer from the lack of a Strategic Plan. Depreciation policies and business case criteria need to be modernized to encourage multi-year investment in initiatives designed to achieve such a Strategic Plan. Major initiatives such as Province-wide patient data, standardized data communications and data interchange formats, and electronic Pharmacare claims are examples of initiatives that cannot be justified by operating savings within one institution, as required by current policy for approval of health care information systems initiatives.

Today's information systems vendors all offer credible solutions for many health care applications. However, the information systems industry is undergoing a rapid transition from "proprietary" technologies which lock-in a customer to a particular vendor, to "open systems" technologies which work with many different vendors' equipment and software. During the

1990's it is an extremely safe generalization to recommend that Manitoba's health care information systems strategies incorporate such "open systems" as standards. Over time, adoption and adherence to these standards will result in systems that work cooperatively, exchanging data and processing functions among institutions and across the Province and the country.

In its deliberations, the Task Force has recognized that the delivery of health care centres on three competing components: Accessibility, Quality and Cost. It was not difficult to identify some of the broad issues at stake under each of these categories:

Quality: Longevity, institutional conditions, waiting lists, ratio of health care providers to population;

Accessibility: Rural versus urban treatment facilities, travel inconvenience or risk, and the types of services;

Cost: Cost containment and affordability, overall health care system costs, fee structures, occupancy, preventative medicine, community health care.

In each of the above cases, the Task Force was provided with numerous examples of enabling technologies with potential for a positive impact. Clinical care systems, automated test result reporting, teleconferencing, substance abuse and allergic reaction data bases, and real-time bed registry would improve quality of care. Telehealth applications, remote clinical and diagnostic systems, and on-line waiting lists would improve accessibility. Cost control applications, automated clerical and management information systems, demand forecasting and capital expenditure planning systems would improve the cost effectiveness of health care.

With so much potential, what is needed is a well-developed strategic plan to exploit these application areas according to an agreed set of priorities and standards. With limited funding, choices must be made from competing alternatives to deliver the best results over an extended period. This could be facilitated with a Health Care Information Systems Strategic Plan focused on the health care problems to be solved, instead of the technologies to be used, or ancillary issues such as economic development. There has been an inordinate focus on whether the technologies would be provided by Unisys, Digital Equipment Corporation or IBM. This is backwards. First decide what is to be done, and then look for the best fit and cost to make it so.

In all of the Recommendations which follow, the Task Force recognizes that there are practicalities which prevent immediate adoption, and that in several cases, interim steps are necessary to gradually move toward the Recommendation. The Task Force has prepared a list of attributes which should be considered in a Health Care Information System and a suggested outline for a Health Care Information Systems Strategic Plan. These are attached as Appendices B and C.

Health Information Systems

Task Force

Recommendations

STRATEGIC PLANNING ISSUES:

Observation

1. Information Systems strategies presented to the task force are not tied to or linked with an overall provincial health care strategy. As a result, the priority-setting process for funding Information Systems in the health care field is undermined by irrelevant issues such as supplier preference, or short term cost/benefit criteria which fail to recognize opportunities for long-term benefit.

Explanation

The programs and plans for systems presented to the Task Force were not linked to an overall Provincial strategy. The requirements for the various systems did not explain how they fitted into any overall scheme except where such a scheme was specific to that institution.

Despite common funding of health care institutions by the Province of Manitoba, individual information systems initiatives have no overall plan, framework, standards or unifying vision for guidance. Instead there appear to be individual criteria for each initiative.

No guiding body, authority or individual is exercising the responsibility to set priorities for major systems that should be developed, in what order, and at what pace.

Consequences

In the absence of a Provincial plan, developments to date are piecemeal and uncoordinated, with significant technical difficulties in sharing data. For example, St Boniface and Health Sciences Centre are on divergent technology paths with differing timetables, while three other hospitals in Winnipeg are recommending a third approach. These systems incorporate differing approaches to health care data base management systems,

differing approaches to financial systems, and differing approaches to data communications.

While much activity has taken place amongst a wide group of institutions, it has been largely uncoordinated. As a result, the province has paid for multiple systems which do the same job in different institutions, and has few institutions capable of exchanging health care data except on paper.

Finally, the extent that such systems contribute to excellent patient care at costs that Manitobans can afford, relies upon each health care institution's information systems plan.

Recommendations

The Minister, through the Council recommended in Appendix A, should develop a Health Care Information Systems Strategic Plan to guide the development of information systems covering all aspects of the health care industry. All major systems development plans put forward for funding by individual institutions should be judged against the plan, its priorities and standards.

Observation

2. There is a wide diversity of computer hardware and software systems for common applications in Manitoba's health care institutions. The diversity does not appear warranted by the differences between the institutions missions and practices.

Explanation

A study done by Peat Marwick for the Tri-hospitals (Seven Oaks, Victoria and Concordia) makes it clear that there are opportunities for hospitals to collaborate in the development and support of hospital information systems, and to use common software. This group should be applauded for their initiative. Further evidence of the benefit is evident in the experience of those hospitals using common health care software at Manitoba Data Services. However, there are many more opportunities for inter-hospital collaboration in the development and maintenance of information systems.

There are many common types of information in Manitoba hospitals including:

- Patient demographic data
- Patient clinical data
- Patient location data
- Orders and results
- Appointments and work scheduling
- Operating room and surgery scheduling
- Human resources data
- Financial and inventory data

There are also common Manitoba Health Services Commission requirements including;

- Patient and physician registry updates
- Abstract information
- Bed registry
- MIS guidelines
- Electronic report submission
- Claims for fee for service

Producing and manipulating this information leads to a number of common information system requirements;

- Admission, discharge, transfer (ADT)
- Central patient index
- Laboratory
- Pharmacy
- Dietary
- Nursing scheduling
- Operating room scheduling
- Order entry / Results reporting
- Patient and physician scheduling
- General ledger / Budgeting
- Human resources including payroll and personnel records
- Accounting and material management
- Cost allocation

Opportunities for cost sharing of software development are abundant. Unfortunately, significant forces operate against such cooperation:

- Health Care Institutions tend to have separate Boards of Directors, with virtually no inter-institutional coordination. In fact, diversity, uniqueness, and even a degree of competition seems to be evident.
- Health Care industry suppliers market to each institution separately. Often a vendor will offer a "partnership" wherein the Institution will benefit from participating in a development which will be subsequently marketed to others.
- There is no requirement for Health Care Systems in Manitoba to conform to common technical standards.

Consequences

Lack of collaboration results in higher development and support costs for the Province as each institution develops their own versions of common applications.

Staff moving from one institution to another require re-training on systems designed for similar functions. For example, a nurse moving from one institution to another must be retrained on the local ADT system as the screen formats and procedures will be different in the new work environment. Transfer of skills is minimized. This lack of standards can lead to frustration and poorer productivity.

Development of standards amongst the various institutions will foster an environment of cooperation in systems development.

It is difficult for regulatory bodies such as Manitoba Health Services Commission to develop reporting standards due to the wide variety of hardware platforms, application architectures and data models.

The development of what might be called "islands of automation" makes sharing of patient and management data difficult if not impossible.

Some institutions argue that their requirements are unique and collaborative development is impractical. While it is true that there is a diversity of requirements and no one system can be expected to meet all requirements, there is enough commonality that opportunities for sharing software and applications abound, with potential savings in both development and support costs. Customization of common software to meet the requirements of an institution should, in most cases, be less expensive than development of a new system. Support could be centralized, further reducing costs to the Province. There may be economies in the acquisition of packaged software when the purchase of multiple copies of a system qualifies for a discount.

Some institutions are developing in-house financial systems which are available from Manitoba Health Organizations Inc. Moving these systems from the Manitoba Health Organizations Inc. system does not reduce MHO's costs. Most of their computer costs are fixed, not variable. The global health care budget borne by Manitobans is not reduced by such duplication, it is in fact increased, and there are no savings to the Province.

Recommendations

The Minister, through the Council recommended in Appendix A, should define common health care application system requirements. Because of the variety of computer vendors' systems now in place in Manitoba health care institutions, no one system will meet all requirements. However, there is no need for everyone to develop and maintain their own.

The Council should also define Province-wide communication standards and electronic data interchange formats to allow patient and institutional information to be shared or exchanged.

Observation

3. There is a proliferation of incompatible computer hardware, software and telecommunications systems from different vendors.

Explanation

In Manitoba, health care institutions do not use standardized computer systems or communication standards. There has been a large degree of autonomy in the selection of hardware, software and telecommunications technologies. Three vendors predominate, Unisys, IBM and Digital Equipment Corporation.

The IBM systems are installed at Manitoba Data Services and are used by a number of hospitals, laboratories and clinics. They use an IBM Systems Network Architecture (SNA) telecommunications standard throughout the Province.

Unisys computers are installed at St. Boniface General, Misericordia General, and Manitoba Health Organization, while a Unisys computer owned by Manitoba Health Services Commission is shared by Grace General, Brandon General and Thompson hospitals. They use the Unisys Burroughs Network Architecture (BNA) standard.

Digital Equipment Corporation computers are installed at Health Sciences Centre, using a Digital Equipment Corporation Digital Network Architecture (DNA) standard.

There is also a network connecting a number of laboratories for transmitting test results. It uses the Envoy 100 telecommunications system from Manitoba Telephone System.

Each of these networks uses a different proprietary communications protocol. While technology is available to exchange information between them, this is a needless complexity and expense which is not justified by any differences in functionality.

Consequences

These multiple technologies needlessly complicate sharing of information between institutions, reducing service and increasing costs.

Recommendations

The Council recommended in Appendix A should specify standard data interchange formats, standard communications technologies and incentives to encourage institutions to use them.

Observation

4. Despite the existence of extensive computerized records and the availability of cost-effective electronic communications there is an inordinate amount of information transfer between various institutions via paper records.

Explanation

Transfer of information between hospitals, Manitoba Health Organization and Manitoba Health Services Commission, doctors, laboratories and clinics is frequently not done electronically. In fact, 65% of Physicians' claims still come to Manitoba Health Services Commission on paper forms. The general public adds to this when submitting Pharmacare claims.

Consequences

Data has to be entered on paper forms and re-entered into different computer systems causing additional costs, delays, errors and omissions, and poorer service.

Valuable system and people resources are used on unnecessary administration that could more appropriately be spent on patient health care.

Recommendations

The Minister, through the Council recommended in Appendix A, should set communications standards, including a data interchange standard, such that different systems can more readily talk to each other. A special program should be started with the goal of streamlining the transfer of records by designing systems that do away with the need for paper interchange. The proposed Province-wide pharmacare system, if extended to the point of sale, and implemented in compliance with electronic data interchange(EDI) standards, would be an excellent example.

Observation

5. Except for the largest Health Care Institutions, information systems for patient care are not extensively implemented in Manitoba.

Explanation

Like many other industries have done in the past, the health care industry began by developing computerized systems for financial applications. These systems were readily available, and at the time of their initiation, information systems technology for broader patient care applications was not.

Unlike other industries, the health care industry has lacked funding to expand the scope of computerization as information systems technological advances provided the opportunities to apply them for patient care benefits. Computerization for these purposes is mainly found in the larger hospitals.

Consequences

Both the extent and complexity of health care services have grown significantly in the past ten years. Patient care information systems would have helped make the delivery of these services more efficient and less costly. People-oriented systems bog down and become error-prone as volumes grow, while computers continue to provide consistent actions under stress.

Patient care systems for automating laboratory testing, dietary functions, and physicians treatment orders, to name a few, represent significant opportunities to reduce costs and to improve the quality of care. Such systems are now becoming widely available at reasonable costs even for smaller health care institutions.

Recommendations

The Health Care Information Systems strategic plan should capitalize on the opportunities available for patient care systems, especially for smaller health care institutions. The plan would consider in its schedule the extent of benefit available in each patient care discipline for the dollars spent,

and would specify the appropriate standards for sharing of data and software which would lead to the most economic implementations.

Because such systems frequently interact directly with individual health care professionals. such as doctors and pharmacists, cooperative enticements such as faster payment of fees for service or provision of systems for use by the practitioner, should be part of the plan. In the longer term, we believe that the government's payback for this investment would include improvements in efficiency and effectiveness in the health care system and a moderation of escalating health care costs.

Observation

6. Manitoba Health Care institutions make extensive use of consultants, particularly in feasibility and needs assessment engagements.

Explanation

Not far into the Task Force meetings, it became clear that many Health Care institutions had engaged consultants in order to develop information systems strategies, needs assessments, or business cases, which have been subsequently used in support of their request to the Commission for funding. Outside advice has been sought by Manitoba Health Services Commission, Manitoba Health Organizations Inc., individual and group hospital facilities, personal care homes, and complete health care departments. It is apparent that issues and observations have been identified and re-identified in many of these reports and it is a near-standard practise to engage outside consultants before embarking on an Information Technology venture.

Consequences

- Health Care institutions which develop a strategic plan, needs assessment or business case by using outside consultants are sometimes paying for advice which has already been given to another institution.

- In the absence of a Province-wide Health Care Strategy, the consulting terms of reference will be unduly broad, adding to the cost.

Recommendations

The proposed Health Care Information Systems Strategy would be very useful in reducing the need for consulting assistance. Clarity of standards, mission, funding policies, and the other normal content of such a policy would not have to be reinvented during each consulting assignment. Until that is developed, and in any event, the Council recommended in Appendix A, should act as a clearing house for consultant reports, and should screen requests for consultant services. Existing reports should be categorized, and indexes of consultant companies' areas of expertise should be developed.

Observation

7. The policy resulting from the funding agreement with Manitoba Health Services Commission for the Unisys A10 Computer which assigns responsibility for patient care systems to Manitoba Data Services and responsibility for financial and administrative systems to Manitoba Health Organization is inconsistent with the need for integration between these systems.

Explanation

Financial and administration information in health care services is closely linked with patient care activities. Costs per unit of service frequently depends upon measurement of some patient care data, for example, costs per patient-day. To offer meaningful reports, financial and administrative systems need to obtain patient care data, and patient care systems need financial and administrative data.

Consequences

Physically separating these systems between different vendors creates unnecessary complexity, and is wasteful of resources.

Patient care systems must be given access to financial data, either by interfacing with another computer, or by duplicate data entry. A similar situation exists for financial and administrative systems, with respect to patient care systems.

The financial and administrative functions in health care institutions are separate from the patient care areas, which tends to perpetuate the separation of systems on this basis, when it is clear that maximum benefit can occur if they are closely linked.

Recommendations

The Strategic Plan for Health Care Information Systems should include technical standards for Province-wide integration of health information systems in Manitoba. Within this framework, the various health care institutions, hardware and software vendors, consultants and government departments can all be involved in the implementation and operation of the information systems within the Strategic Plan.

Observation

8. Absence of Province-wide patient identification causes significant duplication and resulting inefficiencies throughout the health care system.

Explanation

Manitoba Health Services Commission maintains considerable information about the health care services provided to Manitobans. For example there are abstracts of an individual's medical care and family pharmacare claims. This data is not joined by a common number or index, and is not routinely accessible to health care providers and administrators. Health care providers themselves keep extensive records on the services they provide to their patients, but again, this information is not indexed by a common number. Therefore there is no consistent means of identifying each Manitoban to consolidate health information for an individual.

Consequences

There are a multitude of problems that result from the fragmentation of patient records throughout the health care system:

- Through its funding of each institution, the Province pays for an inordinate amount of administrative overhead for each provider who creates and maintains its own records according to its own index or patient number, and in accord with its own unique system.
- The lack of information can jeopardize the health or life of a client where one provider doesn't know of the adverse consequences of certain treatments known to another.
- Clients may obtain services that shouldn't be rendered by going to more than one provider but not telling each one.
- Statistical information which could lead to improvements in health care or cost reduction through better control is not available.

Recommendations

A personal health identification number should be established for each Manitoban to facilitate the compilation of a central patient data base.

As computerized patient-oriented health care systems are instituted by various providers, a central patient data base should be made available so that they can exchange data when needed and authorized. As a natural by-product, many financial transactions such as fee billing, could be automated.

The central patient data base should include all occurrences of health service provided to Manitobans together with demographic information that can be used by all providers. For both practicality and confidentiality reasons, detailed medical and clinical data should reside only with the provider that renders the services. Nevertheless, enough information should be available to let other providers know who else is serving their patient when there is a need to know. In this way contact between two or more providers will be facilitated. Other useful information in the central data bank could include prescribed medications and special health-related warnings for practitioners.

The central data base should be updated immediately for some information, in order to maximize the potential benefit. For example, prescribed medications are best recorded as the prescription is filled in order to detect substance abuse or "double doctoring".

The central data base security guidelines should be established by a separate body containing expertise from the legal profession. In general, security should be based on a provider's "need to know", with a sensitivity to the nature of the data, and the rights of the individual to privacy.

The central patient data base should be accessible through a Province-wide network to all providers without technical complexity.

TECHNOLOGY ISSUES:

Observation

9. The Unisys Initiative has imposed technology restrictions on Manitoba health care institutions and has not delivered the original health care objectives.

Explanation

The Burroughs-Manitoba Strategic Investment Agreement (the Unisys Initiative) was signed on September 26, 1986. The term of the agreement was 4 years. Manitoba committed to spend $30 million on Burroughs health care related products by December 31, 1989, to provide Burroughs with access to a Burroughs mainframe system for health care software development, and to establish an organizational structure with responsibility to ensure that commitments were fulfilled in a timely and coordinated manner.

Burroughs agreed to invest at least a further $33 million in Manitoba by:

- Establishing a Health Care Competency Centre in Winnipeg for research, development, implementation, installation and support of software products for health care markets in Canada.
- Establishing the head office of a networking company in Winnipeg to provide consulting and engineering expertise for the integration and networking of multi vendor computer environments in the Manitoba health care sector.
- Generating a minimum of 52 full time jobs in Winnipeg in the Health Care Centre and the networking company head office.
- Maintaining employment in the Burroughs manufacturing plant at 270 jobs until March 1988 and 100 thereafter to the end of the agreement.

Burroughs subsequently merged with Sperry Corporation to form Unisys.

It has been related to the Task force by parties involved in the negotiations for the Unisys Initiative, that the agreement was to design and implement a unified health care network in Manitoba with the following objectives. It should be noted that these objectives were represented to have been implied in the agreement and do not seem to have been written down;

- Standardized data interfaces to allow sharing of information between systems and health care institutions.

- An "open systems" network architecture allowing a variety of hardware platforms to communicate with each other. The proposed network linking institutions' information systems together would use a proprietary Unisys data communications protocol but communication gateways would be developed to open standard interfaces to allow the connection of non- Unisys hardware platforms to the network.

- The sharing of application software between institutions as much as possible.

- "Made in Manitoba" health care application software which could be marketed across Canada.

The agreement went beyond the normal Manitoba Health Services Commission funding arrangements for health care information systems in Manitoba institutions. The usual funding policy is that Manitoba Health Services Commission funding approvals are given only when there is an identified reduction in operating costs as the result of automation which will offset the capital and development costs of the proposed computer system over a 5 to 7 year period, as well as paying for any operating costs associated with the proposed system. However, under the Unisys agreement, where an institution chose to install Unisys hardware and software, Manitoba Health Services Commission directly funded the capital costs of hardware, software and development/customization/consulting services provided by Unisys to the client institution with no requirement to offset these costs by savings in operating costs. The institution was only responsible for the ongoing operating costs of the system once installed.

An institution opting for a vendor other than Unisys came under the usual funding policy and would be responsible for all capital and operating costs.

The Task Force noted that no institution opted for another vendor during the life of the agreement except for Health Sciences Centre, which already had a major investment in Digital Equipment Corporation equipment and software.

Consequences

The Health Care Information System objectives which have not been met are as follows:

- Most Unisys systems installed during the life of the agreement are isolated and cannot share data with other health care information systems in the Province. For example, the BHIS application software on the St. Boniface Unisys A12 computer is different than the HCMS application software on both the Unisys A5 computer at Misericordia General Hospital and the Unisys A12 computer used by Manitoba Health Services Commission. Minimal common data interchange formats exist between these two application systems and data sharing is therefore difficult. There are also minimal common data interchange formats between the installed Unisys systems and the IBM health care software at Manitoba Data Services which is used by a number of hospitals, or with the Digital Equipment Corporation systems at Health Sciences Centre. The implied objective of sharing data through common formats has not been met.

- A proprietary Unisys based communication network has been established interconnecting the Manitoba Health Services Commission, St. Boniface General Hospital and Manitoba Health Organization systems. Brandon General Hospital and Grace General Hospital are also connected to this network, and hospitals in Dauphin and Thompson will be connected in the near future. However, linkages to the IBM and Digital Equipment Corporation networks in other hospitals have not been fully developed. The implied objective of an open systems communication architecture

interconnecting different hardware platforms has not been met.

- There is very little sharing of software. Through customization and choice of different application alternatives, each institution is developing their own unique versions of software for applications which have similar requirements in all hospitals. Each application therefore requires its own support group. In some cases, software services offered the hospitals through Manitoba Health Organizations Inc. are being duplicated through local development.

- Almost no "made in Manitoba" general purpose health care application software has been developed. The Health Care Competency Centre has been concentrating on customization of various Unisys packages for particular institutions. Very little of their development has been marketed outside Manitoba.

- Some of the installed Unisys equipment is reaching capacity and the institutions do not have the capital funds to upgrade or replace the equipment. Unisys has declared that future development in their health care applications software will follow open architecture industry standards and use the UNIX operating environment. The Burroughs Health Information System (BHIS) and Health Care Management System (HCMS) health care application software is currently incompatible with this direction.

- In respect to funding, institutions not wanting a Unisys solution for whatever reason were penalized by the requirement to fund all costs of a system from their own operating budgets. This restricted their freedom to choose the best alternative based solely on the merits of the technology and how well it met their requirements.

- The decision to proceed with the Unisys agreement was not made solely for support of health care. The primary motivation, as reported to the Task Force, was job protection and creation, technology transfer, and development of a health care software industry in Manitoba. Organizations such as Manitoba Health Services Commission and the

hospitals were brought in after the fact, and had to live with the terms and conditions of the agreement, and with the costs of ongoing support of facilities funded by the agreement.

Recommendations

Agreements between vendors and the Province should be awarded based upon the quality and cost of the proposed solutions in meeting the information system requirements of the health care institutions in Manitoba.

All vendors should have an equal opportunity to compete, based on functionality, quality and price. If a Health Care Institution can make a case to enter an agreement with a any vendor, the funding criteria should not vary depending on the vendor.

Agreements should stipulate that software developed and/or installed should meet predefined Province wide standards for communications gateways and electronic data interchange formats. Such standards should be designed to comply with the evolving Open Systems Interconnect specifications. Provincial standards should be developed with an awareness of emerging international and national standards in health care computing such as Health Level 7 (HL-7), and European Record Document Architecture (ERDA) in order to ensure future compliance.

Manitoba institutions using Unisys HCMS and BHIS software should consider developing a plan for an orderly, phased migration over the next several years, to open systems based upon the Unix standard.

Observation

10. The long term computer technology architectures outlined by Unisys and IBM are not consistent with the current technology of the health care systems implemented in Manitoba.

Explanation

Unisys systems for health care processing installed at Misericordia General, and St. Boniface hospitals as well as Manitoba Health Services Commission and Manitoba Health Organizations Inc. are based on the former Burroughs A-Series mainframe computers. The individual application packages which form the core of these systems, namely BHIS and HCMS, are based on early 1980's designs, which depend upon mainframe and "dumb terminal" (ie. fixed-function) architectures.

According to Unisys Health Care Systems, Charleston, South Carolina, the majority of Unisys' health care systems developments are being designed to run on their departmental-sized, mini and micro Unix computers. These are systems designed for specific application areas such as Pharmacy, Dietary and so-on, joined in a network and sharing patient and other information with each other.

From a Gartner Group article of October 25, 1990...

> "Like SAA, Unisys' new architecture sets the stage for euthanasia of those proprietary platforms that are technologically outmoded or not pulling their weight revenue-wise. Although we do not expect any actual fatalities to occur for some time, Unisys really has little choice in the long term. It simply cannot remain competitive if it must spread its development efforts over the hodgepodge of mutually incompatible product lines that it inherited at the time of its formations in 1986.
>
> "Those users now wedded to Unisys' proprietary platforms should expect them to take on a decidedly more Unix-like countenance over the next few years and to slowly disappear in the latter half of the decade. Again, this is no cause for panic, but users can best prepare for these eventualities by embracing the company's 4GLs and OSI networking products."

Similarly, the IBM mainframe technology systems implemented at Manitoba Data Services using the IBM Patient Care System use mainframe and fixed-function terminal architectures. Like Unisys, IBM has stated that its future development architectures encourage cooperative processing with the mainframe acting as a data repository, with much of the processing taking place on departmental and desk-top systems.

Consequences

Health care systems being implemented by Manitoba institutions (using Unisys and IBM large central computer architectures) are being based on technologies which, although functional in the short term, are rapidly becoming obsolete. Such technologies, over time, can be expected to become progressively more costly as maintenance costs increase and less expensive, more modern technologies are introduced. They will become less viable as new techniques are applied to health care processing such as digitized image storage and retrieval. New software, being developed by vendors only for more modern equipment, will not be easily available to Manitoba institutions.

Older, large centralized computer (ie. mainframe) solutions, are rapidly becoming the highest-cost approach to processing. Currently, raw computer power is most expensive on mainframes less expensive on minicomputers, and even less expensive on microcomputers.

Mainframes continue to be appropriate as large data stores and as communications switches. In highly centralized environments where the data must be stored in one location and accessed by a wide variety of users, mainframe online transaction processing systems will continue to be the most cost effective solution, combined with cooperative processing workstations. Examples are airline transaction systems and some financial applications such as ATM's. Health care systems for individual institutions are more departmentalized, and distributed computing is probably more appropriate.

Recommendations

Manitoba health care institutions' continued development, enhancement, and implementation of mainframe-based health care systems on the current Unisys A-Series and IBM mainframe computers is ill-advised in the long term. This includes specifically the systems for St. Boniface Hospital, Misericordia General Hospital, Manitoba Health Organization, the shared system operated by Manitoba Data Services for processing

information from Brandon, Dauphin, The Pas, and Thompson, and the Patient Care Systems operating at Manitoba Data Services shared by the Tri-Hospitals group. Strategic planning for information systems should incorporate a migration plan to current technology systems for existing initiatives, and new initiatives should be based upon more current technologies.

It should be absolutely clear that the Task Force is not recommending technologies from any particular vendor. We are recommending a switch from the existing mainframe technologies to one which utilizes shared, transportable and cooperative technologies.

Observation

11. Telecommunications and computer technologies are available to deliver improved care to remote locations in Manitoba at significantly reduced cost. The Task Force saw only limited initiatives in implementing these technologies.

Explanation

Newly emerging medical technology in the telecommunications and computer application areas is a constant phenomena. With Manitoba's vast, sparsely-populated North, we noted that Government policy ensures that adequate health care is extended to such areas, by using air ambulance services, and funding transportation to major centres for tests and treatment.

A great deal more is possible using off-the-shelf technologies which could deliver economic, high quality health care services in many remote locations.

For example, EEG and ECG testing can be administered by a para-technical worker in virtually any remote location with a telephone, or even a radio telephone, while "on-line" to a trained technician. Specialists could examine patients or consult with non-specialists using Video-conferencing, and diagnostic information or medical records can be passed between institutions or Health Care practitioners using facsimile transmission, or electronic mail.

In this regard, the Task Force recognizes the excellent initiatives of both Westman Regional and Cadham Laboratories in their implementation of electronic mail systems to facilitate dissemination of test results to remote locations.

Consequences

Cost savings from electronic health care delivery systems are potentially very large. For example, the cost of sending a patient from a northern community to Winnipeg, incurring air fares, hotel and other costs is substantial. Remote EEG equipment would cost less than $5,000 per location and would reduce the procedure to a twenty minute phone call.

The Task Force believes that there are numerous, significant opportunities for savings, which are not mandated for pursuit by any area of the Health Care information systems community in Manitoba. Instead, such initiatives appear to be left up to an individual institution or person to "champion". Without benefit of central leadership, the likelihood of Province-wide adoption diminishes.

Recommendations

Within the context of the Health Care Strategic Plan developed by the Council recommended in Appendix A, a special medical committee should be convened to pursue the opportunities for improving health care delivery and cost in remote locations, using existing, proven computer and telecommunications technologies. The Task Force believes that significant improvements could be put in place within one year.

FUNDING POLICIES:

Observation

12. There appear to be inconsistencies in the business case criteria for funding information systems proposed by Manitoba Health Care institutions

Explanation

Manitoba Health Services Commission has a policy of approving purchases of computer hardware and software only if there is an identified reduction in operating costs within the institution which will offset the capital and development costs over five to seven years. However, if the chosen solution was for Unisys equipment, the requirement was only to show an operating saving, and to obtain approval from a special board consisting of representatives from Unisys, Manitoba Health Services Commission, and the Department of Industry, Trade and Technology.

Several institutions described a willingness on the part of Manitoba Health Services Commission to fund only Unisys solutions, even in the face of significantly lower price quotations from competing vendors.

Consequences

In the case of the Unisys Initiative, the capital costs of technology were subsidized by the Province, reducing the economic payback threshold that would have otherwise been required for approval. As a result, health care institutions became dependent upon this technology without having to bear the true full costs. Now that the agreement has expired, the Institutions are left with upgrades and improvements which must be purchased at full cost, or with equipment that is becoming expensive to maintain.

As the expiry of the Agreement came closer, some institutions which we interviewed said that they made use of the Unisys Initiative simply because it was there and could soon be discontinued rather than basing their choices on cost/benefit analyses. The Task Force believes this was not in the best interests of the Institutions. Limiting competition and encouraging acquisition of equipment and software simply to use up a sum of money by a certain time, while at the same time ignoring the funding of ongoing operating costs guarantees future problems in maintaining the

base of installed equipment. It is not surprising that we found several institutions to be cynical in their attitude toward the funding.

Computer technology choices typically involve long term commitments to particular hardware and software architectures which are not interchangeable from one vendor to another, except with the expenditure of considerable sums and over long periods. Today's computer hardware and software vendors invest heavily in marketing efforts to win each major deal, for they know they will achieve a "lock-in" which can often last for decades, offering the opportunity to raise prices or benefit from normal expansion that will far outweigh their initial costs.

The Province appears to have let its "Procurement Policy" drive the Unisys Initiative, as though computing equipment and software were a commodity, and appears not to have realized that it was laying in place commitments which in the normal course are likely to last well past the turn of this century.

Recommendations

Regardless of equipment or vendor, The Province's policy for procurement of computer systems and software for Health Information Systems should be based upon competitive procurement.

Manitoba health care institutions should accept the lowest bid for equipment and software, and should be required to show a proper breadth of solicitation from multiple vendors in support of their selection. If a given vendor wishes to establish a preferential pricing structure for Manitoba Health Services Commission-funded agencies, then the same opportunity should be given to other vendors in order to maintain competition.

If the Province decides to use its purchasing power for information systems to leverage benefits for Manitoba by guaranteeing a certain amount of business for a particular supplier in exchange for job creation and industry development guarantees, as has been done recently in the Unisys and STM agreements, then they be careful to ensure that any cost increases that will be borne by the institutions using the equipment, are understood and provided for.

Observation

13. Software and hardware amortization periods are unrealistically long.

Explanation

Computer equipment acquired through approved borrowing is depreciated and funded over 16 years.

Manitoba Data Services depreciates hardware over four years and software over three years.

Given the nature of this industry, and the rapid obsolescence of equipment and software, MDS's approach reflects a realistic amortization of costs, while those of health care institutions are unrealistically long.

Consequences

These unrealistic amortization policies are part of the justification process and budgetary control of the various Manitoba health care institutions. As a result, anomalies caused by a failure to recognize the full costs of computer hardware and software within their useful life leads to acceptance of projects or initiatives which would otherwise have been deemed uneconomic.

The inter-institution variances in policy, as dictated by issues such as the method of funding or the Unisys initiative, make costs incomparable between institutions. This may have contributed to issues such as a significant accumulated debt at Health Sciences, lack of operating funds at St. Boniface and other institutions that took advantage of the Unisys initiative.

Recommendations

We recommend that a standard policy of four years for hardware and three years for software be adopted for approval, funding and depreciation by all health care institutions.

Observation

14. The Task Force cautions that computerized information systems, no matter how complete, are not the answer to all management control issues.

Explanation

The Task Force noted that the need for better, more timely, and more accurate management information is a common theme in many institutions' justification for computer systems.

However, we noted two significant flaws that mitigate this issue. Firstly, the institutions must cost-justify management information systems, but in at least in one case, we noted that the proposed extra management information required additional staff to analyze. We fear that the purpose of obtaining the information to make an institution more effective and efficient has been forgotten. Secondly, there is a notion that the new information will facilitate detection of wasteful uses of resources, patient over-servicing, or ills in the administration, to be corrected simply by confronting the guilty parties. We believe there is a distinct possibility that such information can lead to additional studies, posturing, justification and politicking with little value to the institution, especially in controlling costs.

In short, there appears to be an unrealistic expectation of the usefulness of sophisticated, timely management information.

Consequences

As management information becomes more automated, a commitment to real business benefits such as cost and/or headcount reduction is required, or else there will surely be none.

Management information may be collected on a myriad of items, without any credible hope of obtaining value, yet the costs of collection will mount. Where such information has potential value, the chances of realizing it may be slim. While it may, for example, be significant to note that a particular institution has higher or lower costs than another, there is little benefit if the response causes the institution to spend more time and analysis preparing a case that their case load has a higher-than-average complexity.

Recommendations

Management information systems should be judged on their merits, including adherence to the Strategic Plan, and should be cost justified similarly to any other computer initiatives.

Cost justifications might be influenced (on the cost side), by designing them to measure things over which management has some reasonable degree of control. Otherwise, measurement is academic.

Observation

15. From observations made by Hospital Administrators and as represented to the Task Force, the M.I.S. Guidelines appear to be a sound basis in support of the management of Health Care in Manitoba and should be adopted by all institutions.

Explanation

As health care costs spiral upwards, Canadian hospitals and their funding agencies are attempting to maintain established levels of service while trying to respond to technological advances, changes in treatment methods and shifting caseloads. Traditional accounting systems, in particular CHAM (Canadian Hospital Accounting Manual) appear dated in comparison with today's sophisticated automated information systems and are touted by Hospital Administrators as inadequate as a management tool to make resource allocation decisions. In the absence of standards, some hospitals have developed independent or "home grown" solutions. To address this problem, the Canadian Hospital Association initiated the Management Information System Project in1981, to develop a better information tool linking financial, statistical and clinical information. Flowing from that was a set of acceptable measurement standards to provide for increased accountability and comparability between institutions.

Because of the "financial heritage" of current hospital information systems, data flows vertically from each department to the financial system. The MIS Project developed service based departments where resources are related to output measures such as workload measurement systems.

Using a matrix with "functional" (cost) centers consisting of entities such as hotel, diagnosis, therapy, and nursing on one side, and patient groupings on the other, it is possible to identify specific resource utilization. This gives management the data to permit intelligent, strategic and opertional planning for resource allocation.

Features of the MIS Guidelines include the following:

- They can be implemented through most existing Health Information Systems, computerized or manual (with some cost).
- Implementation is modular ie: departmental first, then global, so that implementation costs may be spread out over several years

- The data produced by implementing the guidelines will enable health care institutions to understand their costs and compare with another similar facility by case-mix groupings, by physician service, and by individual physicians

- Impact analysis, evaluation forecasting, and quality assurance program enhancements will be more readily available

To date, there has already been some significant movement toward MIS Guidelines:

- more than half of all Canadian hospitals have already bought the guidelines (all 20 volumes)

- U.S. software vendors are aware that their systems should be amended to provide for MIS compatibility

- On January 24/90 the Commission Board approved the MIS guidelines and asked that an overview be presented to the Health Information Systems Task Force for their concurrence

Consequences

Failure to adopt a common system for financial, statistical and clinical standards will significantly reduce the level of control over health care funding which would otherwise be achievable. Inter-institutional comparisons are essential to ensure the adequacy and accountability of health care practitioners and administrators and the Manitoba Health Services Commission. St. Boniface Hospital has implemented the Cost Catalyst System, an American non-MIS system to track resource utilization by department and/or physician It will only deliver useful in-house comparisons over time.

Recommendations

The Task Force recommends that the Manitoba Health Services Commission approve the MIS guidelines for implementation across all Manitoba Health Care Institutions.

Observation

16. Some of the major computer systems in Manitoba are approaching capacity, and the institutions do not have funds in their operating budgets to upgrade the equipment.

Explanation

Following is a summary of the current capacities of the major hospital computer systems in the Province. The Unisys results are based on a performance analysis done by Joseph & Cogan Associates in February 1990 for Manitoba Health Services Commission. The Health Sciences Centre results are based on interviews with staff at that site.

Manitoba Health Organization has a Unisys A10HX mainframe system running mainly batch applications. Central processor utilization averages below 40% over a 24 hour period, peaking significantly in the evening during large batch runs. This is not a problem, as such peaks are due to the nature of batch processing. Memory is well utilized and is not causing performance bottlenecks. The disk storage channels are very unbalanced, and reorganization is required to optimize use of these storage devices.

Manitoba Health Services Commission has a Unisys A12 computer system operated by Manitoba Data Services. Currently the Central processor is at a moderate level of utilization and is not creating any processing delays. There are no excessive overheads due to memory management. There are no problems in the disk storage subsystem. Use of the system will decrease with the expected departure of Unisys Health Care's development centre from the system.

Misericordia General Hospital has a Unisys A5 system installed on site. Central processor utilization is very low. Memory utilization is high and could potentially be a bottleneck as new applications are installed. There are no problems with the disk storage subsystem.

St. Boniface General Hospital has a Unisys A12 system installed at Manitoba Data Services. Central processor utilization is very high and is creating significant application processing delays. Memory utilization is also high but is not currently creating delays. The disk storage subsystem is not creating problems.

Health Sciences Centre currently has 4 Digital Equipment Corporation computers installed in a cluster. There have been significant application processing delays, resulting in overly long response times at terminals. These delays have been temporarily alleviated by the recent installation of the fourth system, which is about 50% utilized. The remaining capacity of this system will be taken up by the ambulatory care application, due to be installed in the near future. Once this application comes on stream, the 4 systems will once again be at full capacity, and it will not be possible to keep online response times within their criteria of 3 seconds.

Consequences

The systems at Manitoba Health Organization, Manitoba Health Services Commission and Misericordia General Hospital are not yet at capacity. St. Boniface General Hospital is currently facing a capacity problem and will need to address this in the near future if the system is to remain viable. Health Sciences Centre is not yet at capacity, but will be in the near future.

When a computer system reaches capacity, processing delays are experienced that degrades response times at workstations. It is a generally accepted criteria that adequate response times are critical for user acceptance of a system. Elongated or unpredictable response times lead to frustrations and unwillingness to use a system, and in the extreme, may make a system unusable. The Task Force observed one example where emergency room practitioners were kept waiting for test results for 10 to 15 minutes and had to call the laboratory to resume treating a patient. Most commercial computer sites consider response times of 2-3 seconds as acceptable.

There is also the "knee of the curve" phenomenon. Computer performance does not degrade slowly. When a system reaches capacity, response time degrades quickly, and appropriate preventive measures should be taken as quickly as possible. These measures will include upgrading components of the system and/or removing applications from the system.

There may be price-versus-performance issues. For example, the investment in computer equipment through the Unisys Agreement was significant. In the case of St. Boniface General Hospital, the system is reaching capacity long before all planned applications in the packaged health care software have been implemented. This may also be true in the future at Misericordia General. Reaching capacity at this point in the development cycle seems to indicate that the systems' capacity was undersized for the application needs from the beginning. It is also

questionable whether the performance of the systems justifies the investment. At Health Sciences Centre, a similar situation exists where the system is reaching capacity before necessary applications are installed, even after significant investment.

Recommendations

Before new applications are installed on computer systems in Manitoba hospitals, the institution should estimate the resource requirements of the new application and determine if the existing computer system is capable of handling the application within reasonable performance guidelines. New applications should be tested for resource implications before being put in production. Standards of performance should be applied to applications as part of the system test process, and performance tuning should be a required systems installation task.

The Minister of Health, through the Council recommended in Appendix A, should require that a capacity study of each large health care computer installation be produced on a yearly basis, including present capacity and performance measures, estimated impact of new applications in the next twelve months, and a plan for addressing capacity issues during the period. This plan should include costs of hardware and software upgrades and sources of funds to meet these costs.

St. Boniface General Hospital and Health Sciences Centre will shortly require upgrades of their computer systems. No funds exist in current operating budgets for these upgrades, because the equipment has not been depreciated and equipment replacement funds were not accrued during the life of the systems. It may also be necessary for Manitoba Health Services Commission to provide one time funding to the institutions for immediate upgrades. In the future, all institutions should be required to make annual contributions to a replacement account for computer equipment from their baseline budgets to provide for equipment replacement and upgrades without special funding from Manitoba Health Services Commission. These accounts should be based on a four year depreciation schedule.

Price-versus-performance should be a consideration in choosing the equipment appropriate for a hospital. In many cases, distributed client server systems will prove more efficient than centralized mainframes.

Observation

17. Computer systems implementations by Manitoba Health Care institutions appear to underemphasize the need for extensive and comprehensive training, especially where the applications are being installed in rural locations or for first-time users.

Explanation

Health care institutions in Manitoba have embarked upon extremely aggressive systems implementation schedules, on limited budgets in an attempt to serve an irresistible demand within their facilities. Where funding has run out in the development or testing phase of a project, training and support are cut back or dropped to minimize cost overruns.

Consequences

Newly installed HIS applications negatively received by the user community, criticized as inadequate, inappropriate, or even unworkable have a significant adverse impact on morale and productivity. A proper training program which begins at the hardware and software selection process will help ensure that the user community accepts the system, and is willing to adapt with flexibility instead of with disdain. Typically, after implementation, the full potential of the application is realized much faster if staff have been involved from the beginning, and carefully trained to use it.

Recommendations

Computer technology initiatives reviewed for funding by the Department of Health should include a full allotment for adequate training. Any proposal deficient in this area should be considered to understate the full costs, or be susceptible to failure to deliver proposed benefits. Computer technology initiatives should always include shared involvement from all facets of the institution, including executives, end users, as well as vendors and consultants (if proposed).

Council on Health Care Informatics

The Task Force recommends the establishment of a Council on Health Care Informatics, reporting to the Minister of Health, with the following mandate;

- To develop and publish a Strategic Plan for Health Care Information Systems in Manitoba updated annually, in conjunction with the policies of the Department of Health as set by the Minister.
- To review yearly submissions from agencies and institutions detailing their operational plans and budgets for health care information systems development and to audit progress.
- To integrate institutional and agency initiatives in order to prevent duplication of system development and to make efficient use of computer and human resources.
- To advise the Minister of Health on matters of policy in health care information systems.
- To develop technical standards and protocols, and to ensure institutions participate in joint developments for health care information systems.
- To identify and facilitate joint research and development in health care information systems with private sector companies and the Federal government.

The Council should consist of the following seven members, appointed by the Lieutenant Governor in Council;

- The Deputy Minister of Health
- The Executive Director of Manitoba Health Services Commission
- Two representatives from the Health Care sector
- Two representatives from private sector organizations with expertise in information system development

- One representative from the community

Attributes of a Health Care Information System

There is no single definition of an ideal health care information system. However, standards exist in information system design that should be applied to health care computing applications designed to meet the needs of all the stakeholders in the health care environment in Manitoba.

The goal of any information system is to store, manipulate,classify and report on information pertaining to its users or clients so as to achieve a monetary benefit and/or a quality improvement. In the case of a health information system there are a number of clients. These include institutions such as hospitals, personal care homes, clinics, etc; practitioners such as doctors, nurses, pharmacists and lab technicians working in the community and in institutions; government agencies such as the Department of Health, Manitoba Health Services Commission and Manitoba Health Organizations, Inc.; and the ultimate client, the patient under care. Each client has different needs, and a the total health care information system should address the needs of all client groups within established policies set for standards of access, quality and cost of health care.

INSTITUTIONS

Health care institutions have a number of requirements. Financial systems are required to keep the books of the institution, to handle billings to the appropriate government agency, to manage a variety of administrative functions including purchasing, inventory and office automation, for maintenance of personnel records, for payroll, and to report on a number of parameters so the administration of the institution can implement cost accounting procedures.

Each institution also has a number of departmental systems requirements. Dietary departments need a system to manage recipes, food inventory and ordering, meal orders, to analyze food costs and to generate administrative and therapeutic information on specific patients. Housekeeping departments need information on patient location, bed utilization, and staff assignments. Operating rooms need to be scheduled, as do surgeons, anesthetists and special equipment. The admissions office needs admission, discharge and transfer systems for admitting patients, often from a number of locations, capturing patient demographic and insurance data, allocating the patient to a bed and ward, and notifying the appropriate departments of the new arrival. Discharging a patient involves updating and archiving medical records. Transferring a patient

involves notification of the change to a number of departments. Outpatient areas have their own requirements.

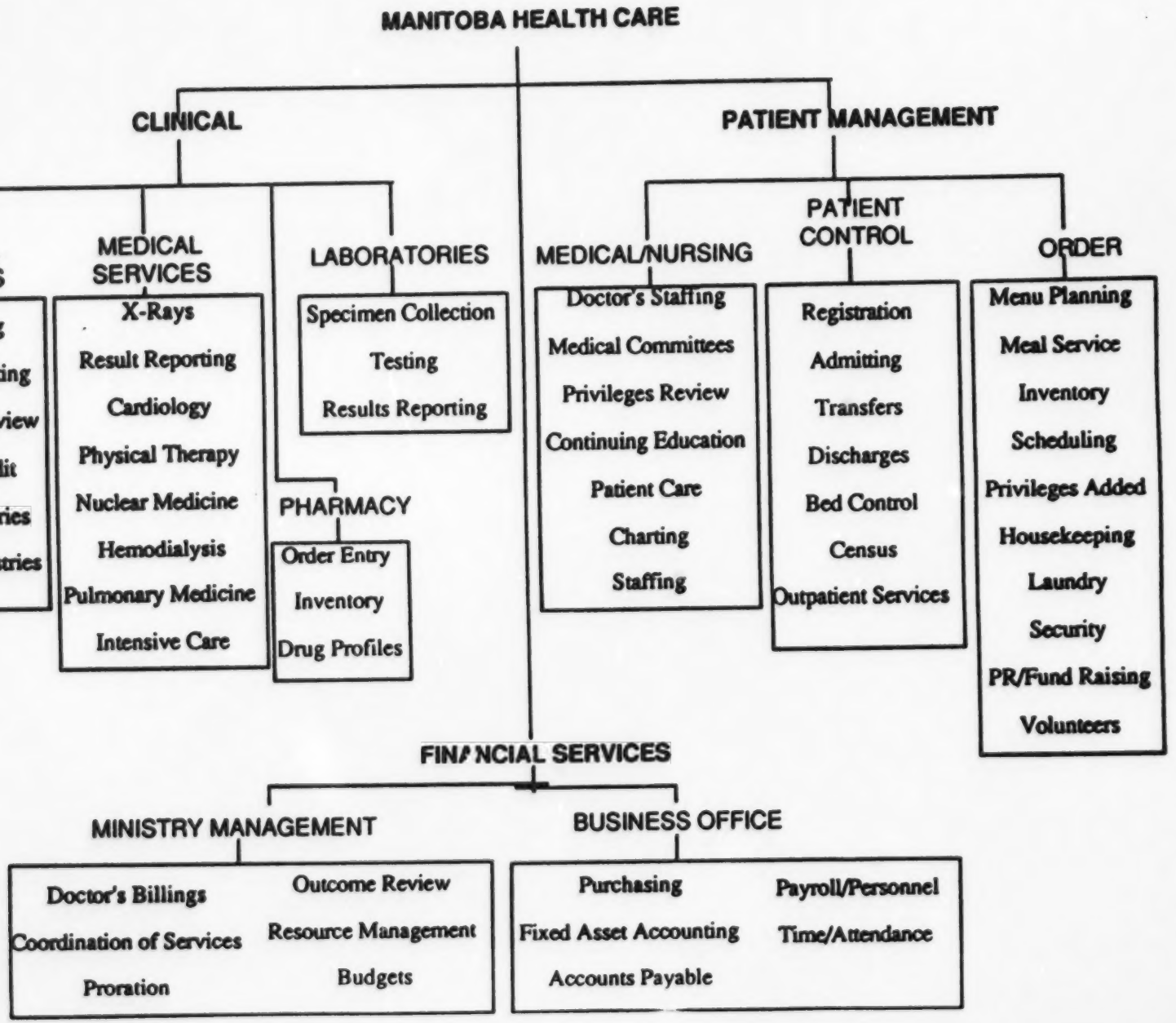
Larger institutions have laboratories on site. These facilities require systems to automate such functions as blood analyzer equipment. Results of tests must be collected and reported back to the practitioner who ordered the test. Workload management and quality control are other requirements of a lab system.

Pharmacy departments require systems for label production, inventory control, patient medication profiles, drug conflict checking, and general management of the unit.

Medical record management is required for patients in the institution and for archival storage of past patient records.

The common denominator across departments is the patient under care.

A pictorial chart of many of the sectors of Health Care are shown on the following page for reference:


MANITOBA HEALTH CARE
CLINICAL
PATIENT MANAGEMENT
MEDICAL RECORDS
Abstracting
Cost Accounting
Utilization Review
Medical Audit
Patient Histories
Tumour Registries
MEDICAL SERVICES
X-Rays
Result Reporting
Cardiology
Physical Therapy
Nuclear Medicine
Hemodialysis
Pulmonary Medicine
Intensive Care
LABORATORIES
Specimen Collection
Testing
Results Reporting
PHARMACY
Order Entry
Inventory
Drug Profiles
MEDICAL/NURSING
Doctor's Staffing
Medical Committees
Privileges Review
Continuing Education
Patient Care
Charting
Staffing
PATIENT CONTROL
Registration
Admitting
Transfers
Discharges
Bed Control
Census
Outpatient Services
ORDER
Menu Planning
Meal Service
Inventory
Scheduling
Privileges Added
Housekeeping
Laundry
Security
PR/Fund Raising
Volunteers
FINANCIAL SERVICES
MINISTRY MANAGEMENT
Doctor's Billings
Coordination of Services
Proration
Outcome Review
Resource Management
Budgets
BUSINESS OFFICE
Purchasing
Fixed Asset Accounting
Accounts Payable
Payroll/Personnel
Time/Attendance

PRACTITIONERS

Practitioners have a number of information requirements. Community health and critical care, nurses, doctors, therapists and others need to capture and coordinate information at the "point of care". This information must be timely, available and coordinated since it may create orders to a number of different caregivers. New technologies such as point of care terminals will complete the circle of information sharing. Timely information also aids treatment planning and case mix management.

GOVERNMENT

Government agencies require each institution and practitioner to report common information on patient care that is captured in a central repository for health planning, claims management and other statistical purposes. Institutions are also required to report on financial matters so the central funding agencies may monitor institutional costs and performance.

PATIENTS

The ultimate client of a health care information system is the patient under care. While the patient is not a direct user of the information, it is frequently critical to their care, such as in the case of allergies, or conflicting medications. Any system must recognize that its goal is to serve the patient.

ATTRIBUTES:

Systems Commonality

Each institution is unique, and as such has some unique requirements. However, there is much commonality in requirements, and an integrated health care information system should exploit this commonality by using software and hardware which will serve a number of institutions who have similar requirements. For example, admission, discharge and transfer functions are essentially the same in any institution, and each institution should be using the same type of computing facility in support of this function. Each institution may have a local ADT system, but the same software should be used on each hardware platform. Other examples abound. Duplication in development and

support of similar functions in a number of institutions is expensive and unnecessary.

Optimal Use of Data

Location and security of information is another important criteria in a health care information system. Some information is unique to an institution and should be kept on the system at the institution. This includes information in departmental systems such as pharmacy and the lab, and patient information required by these systems. However, much patient information is potentially used by a number of institutions and should therefore be kept in a central database on a computer not owned by any institution. This will avoid duplication of shared data and will ensure that all authorized users are looking at the same copy of the data. Finally, medical records are very confidential and any system should ensure that only authorized persons may look at a patient's medical information.

Open Systems

In both the private and public sectors, there is a clear trend in development of information systems to open systems built around predefined standards for data sharing and communications. The reason for this trend is that information system managers have recognized the economies possible in developing open systems. It is no longer necessary to rely on a single vendor's proprietary hardware and/or software. Having well defined standards allows an institution to pick and choose the hardware and software most appropriate to the application without sacrificing any potential integration with other information systems. It also allows a number of institutions to share software for common functions on a variety of hardware platforms. Finally, standards encourage a competitive environment amongst suppliers. Such competition can only benefit the institution developing the facility.

The term "open system" is one that is often misunderstood and used inappropriately. To many it means the UNIX operating system and compliance to a single database and communications architecture. However, this perception fails to recognize that any open integrated health care information system in Manitoba must operate and coexist with a number of hardware and software platforms already in place in hospitals and government departments.

In keeping with this requirement to coexist with installed systems, the most important attribute of open health care computing systems is interoperability, defined as the ability to use standard interfaces to allow data sharing and communication between different applications running on different systems. The complete computing environment is not just the operating system and hardware, but must include the data and communications environment.

Standards

One of the key issues in health care computing in Manitoba is defining standards which will allow for sharing of data and communications between different systems. For example, it should be possible to define a common admission and discharge data format to be followed by all ADT systems in all institutions. The nurse or ward clerk would then see the same information in the same format on a screen in any institution in the province when admitting or discharging a patient. If a patient is transferred to another facility, having a common communications architecture would allow transfer of the patient's data to the receiving institution electronically without the necessity to re-key the information. There are numerous other examples which demonstrate that enforcing standards in development of health care systems will reduce workloads both in institutions and in government agencies, assist in sharing of common software, help in reporting to central government agencies, and significantly reduce future capital and operating costs of health care computing in Manitoba.

Client - Server Computing

Another developing trend in computing systems is use of client/server architectures. This is the computing architecture in which clients which are typically smaller machines running local systems in a department, cooperate with servers, which are usually larger computing systems, to do the necessary work. It is actually taking a process and splitting it into two pieces where each part of the system does the appropriate piece of work. Quite often, the split is typically having the server do data storage and some manipulation functions, and having the server do data entry, data validation functions and to be responsible for the user interface. It is essentially the disaggregation of the classic components of a computer application between client and server, tying them together with a data communications network. The classic model of a large

mainframe computer system servicing a number of applications through the use of "dumb" terminals is changing to one of cooperative processing and distributed databases. This change is being driven by the need for faster and more economic application development, and by the savings which result from distributing the various components of the application to appropriate hardware platforms. In the future, applications software will be more granular, to take advantage of additional facilities provided by future system software, scalable to allow users to exploit the communications network and run applications on all sizes of platforms, and portable so that users can take advantage of capabilities which appear in different operating environments.

Example

As an example of a distributed system, take the case of a dietary system in a hospital. The work in preparing the menus based on the patient's history and the provider's instructions would be done locally on the client machine. The data on the patient which defines location would be stored centrally on a server machine as this data is also used by a number of other systems. Any changes in the patient's status or location would be done on the server machine and would therefore be instantly accessible to all client systems in departments such as housekeeping and pharmacy. Data which is unique to the department is kept on the client machine in the department. The advantage of such an architecture is that data is kept where it is used, and only kept on a central system when it is shared by more than one client. Data is timely, and only the minimum required number of copies of the data exist. The user interface is common, and what the user sees in respect to icons, words describing functions, and commands to achieve a result is the same across applications. This is sometimes called the "common dashboard" model. Cooperative processing optimizes information technology resources.

Once again, such a system requires standards in data formats and communications which allow sharing of data amongst a variety of applications running on heterogeneous distributed data management environments using a variety of hardware. The advantage of this architecture is that the size and type of computing hardware is tailored to the application which results in reduced overall system cost. It also encourages open systems and the use of non-proprietary technologies.

SUMMARY

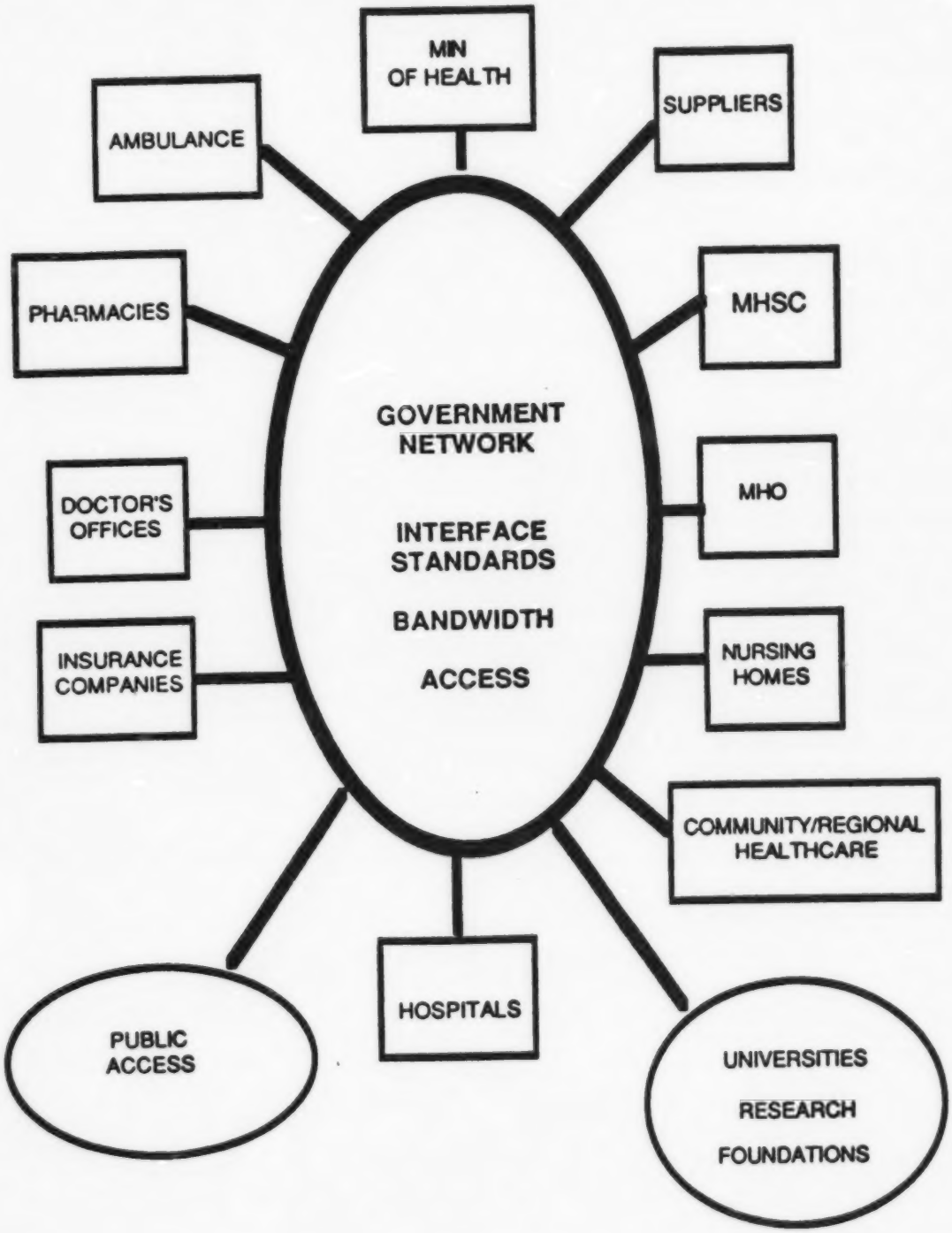
Any integrated health care information system must take these architectures into account, and must define the standards necessary to implement them. Doing so will result in significant increases in productivity and will also reduce costs.

An ideal integrated health care information system will be both evolutionary in the sense that it will have to coexist with current systems during a transition period, and revolutionary in the sense that past application development and hardware approaches will be obsolete, and developers will have to choose a new suite of tools and applications. End users will have to assume a much more active role in application development and systems integration through user committees and advisory groups. Finally, this integrated system should be built from standard components so that its components may be mixed and matched in various institutions according to need.

The final attribute of a comprehensive health care system in the province is support from the provincial government in funding and governance. Institutions must be allowed to develop their own systems to meet their own requirements within the framework of established standards. Compliance to these standards must be enforced. Establishment of a centralized system will be necessary for those data which should be kept centrally. These data will include encounter inventories, billing information, master patient indexes using a unique PHIN number, etc. This system should be under control of the Department of Health.

It is evident that a Provincial Health Network will be required to facilitate sharing of patient, financial and statistical data. The diagram following has been adapted from one of the suppliers' presentations and is provided as an example identifying the issues and users of such a network:

PROVINCIAL HEALTH NETWORK



Attributes of a Health Care Information Systems Strategic Plan

The Task Force feels that a successful plan should include the following;

Mission Statement:

A clear concise mission statement is necessary. An example of such a statement is;

> *The mission of health care computing is to improve the quality of patient care and to respond to the needs of health care providers by making available the most efficient and cost effective computing facilities and support.*

Goals:

A statement of the goals of health care computing facilities in Manitoba. Examples of such goals are; (This is by no means an exhaustive list)

- Respond to provider's needs for hardware, software and information and services in a way which meets the needs of as many providers as is possible in a cost effective manner.
- Manage and maintain shared computing resources to deliver effective computing, data storage and other services.
- Integrate data where possible to prevent duplication and optimize use.
- Integrate services and application development around defined standards.
- Encourage institutions to develop robust and effective applications software, and to provide tools and data structures which allow providers to derive information from common data.
- Provide expert technical advice on common needs.

- Maintain standard and consistent procedures to provide secure computing environments and to ensure the integrity of data.

- Promote through funding mechanisms a working environment which fosters individual and professional growth of health care computing professionals in the institutions.

- Develop and enforce standards in data structures, networking, user interfaces and application development.

- Encourage a diversified computing environment so that requirements may be met with appropriate solutions.

Strategic Objectives:

Strategic objectives are a means of achieving the goals defined above. Examples, once again not an exhaustive list, include;

- Improve access to resources for all constituencies.

- Choose and enforce a networking standard so that institutions can share data and so that the network becomes a provider of services such as electronic messaging and data transfer, thus allowing providers to do as much as possible from their local environment.

- Encourage common user interfaces in development of common applications -eg- the ADT interface should look the same in each hospital.

- Make specific efforts towards global data design and the reduction and prevention of data redundancies.

- Develop a model of the computing services institutions should offer, including a complete province wide networking plan.

- Encourage through funding joint efforts amongst institutions in application development and sharing of resources.

- Develop and publish standards in data structures, networking, electronic data interchange, user interfaces and application development.

- Use the competitive pressures in the computing market and the leverage of the province's purchasing power to acquire the most cost effective computing solutions.

Any information system consists of a number of components, including the data, networking technologies, user interfaces, hardware and software platforms, application development tools and database management systems. A strategic plan for computing should address all these issues and should provide a framework around which institutions can develop their own systems.

If goals and objectives are known and accepted, each institution may then develop yearly operational plans for system development within this framework which meet their own requirements as well as the global requirements of the province. Government should require development of such operational plans on a yearly basis and should review these plans to identify common opportunities.

The Task Force feels that it is essential that standards in networking, data structures, data exchange and user interfaces be well defined in a provincial strategic plan for health care computing if Manitoba is to reap the considerable benefits in cost savings and improved patient care which will result from systems being developed to a common purpose.

Task Force Meeting and Guests

Meeting Date	Guests
February 20, 1990 March 2	Dr. A. Naimark Mr. G. Neill, Director, H.I.S., M.H.S.C. Mr. J. Dale, Senior Manager, Integrated, Health Systems, M.H.S.C.
March 8	Mr. G. Neill Mr. J. Dale Ms. Wendy Fox, Information Officer, M.H.O. Mr. Jim Westwood, Chair M.I.S.S. Advisory Committee, M.H.O. Mr. Keith Wenzoski, Manager, Data Centre Operations, M.H.O. Mr. Glen McLennan, Acting Director, Facilities Financial Services Division, M.H.O. Mrs. H. Willkie, Acting Executive Director, M.H.O. Mr. Cam Marsland, Assistant Executive Director, Hospital Services, Grace Hospital Ms. Kathy Stansfield, Program Coordinator, Grace Hospital Mr. Jack Litvack, Executive Vice-President, St. Boniface Hospital Mr. John McKenna, Assistant Vice-President, Health Information Systems, St. Boniface Hospital
March 22	Mr. T. Bartman, Executive Director, Misericordia Hospital Mr. Art Hiebert, Assistant Executive Director, Misericordia Hospital Mrs. Sharon McMichael, Director, Information Services, Misericorida Hospital Mr. S. Enns, Executive Director, Concordia Hospital Mr. S. Isaak, Secretary/Treasurer, Concordia Hospital Mr. Ron Birt, Executive Director, Seven Oaks Hospital

	Mr. T. Woodward, Assistant Executive Director, Diag./Ther. Services, Seven Oaks Hospital
	Mr. B. Blais, Executive Director, Victoria Hospital
	Mr. P. Sloggett, Assistant Executive Director-Operations, Victoria Hospital
April 3	Mr. R. Thorfinnson, President, Health Sciences Centre
	Dr. J. Horne, Senior Vice-President, Corporate Planning and Development, Health Sciences Centre
	Mr. J. Marshall, Assistant Vice-President, Information Systems, Health Sciences Centre
	Mr. A. Parlin, Director of Finance, Health Sciences Centre
	Ms. Connie Montgomery, M.I.S. Project Manager, M.H.S.C.
April 11 (in Brandon)	Mr. Glen Chapman, Executive Director, Brandon General Hospital
	Mr. Ron Thomas, Assistant Executive Director, Brandon General Hospital
	Ms. Marguerite Bicknell, Assistant Executive Director, Nursing, Brandon General Hospital
	Dr. Allen Aizenman, Medical Director, Brandon General Hospital
	Mr. Don Ferrier, Administrative Technologist, Westman Regional Laboratory
	Mr. Rod Pohl, Director, Management Information Systems, Brandon Hospital
	Ms. Cindy Volden, Coordinator, Computer Education, Brandon Hospital
	Mr. W. Harris, Executive Director, Dauphin General Hospital
April 17	-
May 9	-
May 22 A.M.	Tour at Health Sciences Centre Dr. J. Horne Mr. J. Marshall
May 22 P.M.	Tour at Cadham Provincial Laboratory Dr. G. Hammond, Director, Lab and X-ray Services Division

	Mr. M. Burroughs, Manitoba Rural Lab and X-ray Units Mrs. J. Matthews, Administrative Officer
June 6	-
June 25	-
June 28 A.M.	Tour of St. Boniface Hospital Mr. J. Litvack
June 28 P.M.	Dr. B. Kirk, Associate Dean, Faculty of Medicine, University of Manitoba
July 17 A.M.	G. Tinkler, Industry Executive, I.B.M. D. Thomson, I.B.M. B. Ingham, Health Industry Manager for Canada, I.B.M. P. Billard, Production and Service Manager, I.B.M.
July 17 P.M.	W. Wilson, National Account Sales Manager, Manitoba Public Sector,Digital Equipment Corporation P. Artinoff, Health Care Market Manager for Canada, Digital Equipment Corporation R. Dunn, Management Consultant, Digital Equipment Corporation D. Cochrane, Account Manager, Health in Manitoba, Digital Equipment Corporation
July 26	Mr. Roy Brown, Executive Director, Deer Lodge Hospital Mr. Art Skoda, Deer Lodge Hospital G. Neill, RE: Sale of M.D.S.
August 2	-
September 13	Mr. Ian Blicq, Assistant Deputy Minister, Health Industry Development Initiative, Province of Manitoba
September 27	Mr. T. DeLuca, Director, Information Technology Review Office (ITRO), Province of Manitoba
October 23	Mr. B. Loudon, Branch Manager, Unisys Canada, Inc.
November 20	Mr. B. Loudon Mr. A. Kaplanis, Executive Vice-President, Marketing, Unisys Canada, Inc. Mr. L. Engwer, Manager Health Care Marketing, Unisys Canada, Inc.

	Ms. J. Gilfillan, Vice-President, Marketing, Unisys Canada, Inc. Mr. G. Cyr, Account Executive, V.A.M., Unisys Canada, Inc.
November 28 December 13, 1990	- Final Meeting

Appendix E

Task Force Presentations and Responses

Organization Contacted by Task Force	Response -Presentation (P) -Written Response (W) -Tour (T)
Manitoba Health	P
M.H.S.C.	P
M.H.O.	P
Grace Hospital	P
St. Boniface	P, T
Cadham Provincial Lab	T
Health Sciences Centre	P, T
Misericordia Hospital	P
Victoria Hospital	P
Seven Oaks Hospital	P
Concordia Hospital	P
Brandon General Hospital	P, T
College of Physicians and Surgeons of Manitoba	-
Winnipeg Municipal Hospitals	W
Deer Lodge Hospital	W
Faculty of Medicine, University of Manitoba	P, W
All Rural Hospitals:	
-Lorne Memorial Hospital	W
-Pembina-Manitou Hospital	W
-Portage Hospital	W
-Seven Regions Hospital	W
-Lac du Bonnet Health Ctre	W
-Dauphin Hospital	P
-Morris Hospital	W
-Carman Hospital	W
All Personal Care Homes:	
-Foyer Notre Dame	W
-Middlechurch Home	W
Manitoba Pharmaceutical Association	W
Victorian Order of Nurses	W
Manitoba Dental Association	W
Manitoba Chiropractic Association	-
Manitoba Optometric Society	-
Manitoba Organization of Nurses Associations	W
Manitoba Association of Registered Nurses	W
Manitoba Medical Association	W

Digital Equipment Corporation	P
I.B.M.	P
Unisys Canada, Inc.	P
Information Technology Industry Development, Infotech	-
Policy Management Secretariat	-
Health Industry Development Initiative	P

Information Technology in Community Health - Conference in Victoria, B.C.- two members participated

Ministry of Health, Province of Ontario- telephone conversation

Appendix F

Task Force Members

George Bass, QC (MHSC Board Liaison)
Barrister and Solicitor
Paterson, Bass, Ross, Jackson

John Bulman (Health Advisory Network Liaison)
President
The Bulman Group Ltd.

Marian Cooper
Vice President, Corporate Systems
The Great West Life Assurance Company

Barbara Duke
Consultant
Canadian Health Care Telematics Corp

Walter S. Hill (Chair)
Senior Vice President, Information Systems and Corporate Planning
Investors Group Inc.

Deborah Malazdrewicz (Alternate secretary)
Statistical Analyst
Manitoba Health Services Commission

Gerald E. Miller
Director, Computer Services
University of Manitoba

Oz Pedde
Senior Vice President and Director
Richardson Greenshields Canada Limited

Charles Sawyer (Secretary)
Project Manager
Manitoba Health Services Commission

Acknowledgements:

The Chair acknowledges and thanks all members of the Task Force for their wisdom, dedication, creativity, patience and humour.

It is extremely valuable that the leaders of several of the Province's largest and most experienced computer departments were represented. The recommendations herein were developed by a group who, collectively, are responsible for annual data processing expenditures approaching $100 million per year, in organizations where computer systems are an integral part of the strategic planning process.

Terms of Reference

Terms of Reference provided to the Task Force by the Health Advisory Network are as follows:

Observations

1. Information processing functions for MHSC and Manitoba Health were consolidated as of November, 1986 within the Health Information Systems Division of MHSC.

2. Manitoba's hospitals' in-patient information systems have required extensive adjustments to developed computer software to satisfy each hospital's information needs.

3. Growth of patient registration information systems in Manitoba's hospitals has been slow.

4. The current funding policy for development of each hospital's management information system requires that the hospital justify development expenses through offset cost savings.

5. Manitoba's hospitals employ a standard (paper) system for reporting in-patient hospital utilization to MHSC. Difficulty exists to change this (paper) system to report this data to MHSC electronically. This problem arises from incompatibilities of computer technologies in the Manitoba health care system.

6. Systemhouse concluded a feasibility study in January 1989 which recommended an implementation plan (pilot test) for improved health information reporting with multi-vendor hospitals' communications systems.

7. In May, 1989, the Manitoba Health Organizations. Inc. (MHO) announced major new "Strategy and Direction" document which redefined the MHO role as a provider of information services.

8. MHSC is considering doing a pilot test of hospitals' multi-vendor information system reporting.

9. Health facilities such as community clinics, V.O.N., St. Amant Centre, residence or support type homes or services have developed or are developing patient/client data systems.

10. Life cycle health data systems are being developed in schools and other agencies in many countries.

11. The public is moving quickly towards home computerization with possibilities for health education and life-style programs that will impact on the family's health and on the nature and types of health services needed in the future.

12. Health professionals are becoming computer literate and the nature of services they will offer in the future in the light of the above, will present unlimited opportunities for their involvement in software program development and health education programs generally.

13. Educational programs for professionals are changing dramatically to ensure graduates are capable of maximum use of the computer and information systems in health care.

The duties of the Health Information Systems Task Force are to review and recommend as follows:

Review

1. Requirements by MHSC for health information systems.

2. Access and confidentiality issues regarding health information systems.

3. Existing and potential health telecommunication networks in Manitoba.

4. The Systemhouse Network Study Report regarding Manitoba hospitals' information systems.

5. The MHSC funding policy for development of health facilities' information systems.

6. Hospitals' needs for the use of health information systems.

Recommend

1. Policies to control hardware and software acquisition, development, coordination and funding of health information systems.